UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF NEW YORK

ARMSTRONG PUMP, INC.,

Plaintiff,

v.

REPORT AND RECOMMENDATION
10-CV-446A

MR. THOMAS HARTMAN
d/b/a The Hartman Company and
OPTIMUM ENERGY LLC,

Defendants.

I. INTRODUCTION

Chief Judge Skretny referred this case to this Court under 28 U.S.C. § 636(b). Pending before the Court are requests from plaintiff Armstrong Pump, Inc. ("Armstrong") and defendant Optimum Energy LLC ("Optimum") to interpret terms that appear in various claims of three different patents filed by defendant Thomas Hartman ("Hartman"): Patent No. 5,946,926 (the "'926 Patent"); Patent No. 6,257,007 (the "'007 Patent"); and Patent No. 6,185,946 (the "'946 Patent"). The parties are disputing terms in the patents and have asked the Court for claim construction because, approximately two years after this case began, plaintiff challenged the validity of the same patents that it licensed from defendants in the first place and for which it still pays royalties. Optimum generally has proposed construing the disputed terms in ways that demonstrate how the patents advance

heating, ventilation, and air conditioning ("HVAC") technology beyond any prior art.

The Court held a claim construction hearing on May 30, 2013. In the pages that follow, the Court identifies the terms in dispute and interprets those terms based on all the information that the parties have submitted. The Court respectfully recommends adopting those interpretations for the reasons explained below.

II. BACKGROUND

A. *Case History*

The Court will not repeat the full history of the case here, because the history appears elsewhere in the docket and because this Report and Recommendation focuses on claim construction. Briefly, this case began as a breach of contract case that escalated into full-blown patent litigation in a tribute to the Cold War doctrine of mutually assured destruction. On or around February 4, 2005, Armstrong and Hartman entered a Licensing Agreement that allowed Armstrong to sell HVAC systems that employed technology from Hartman's three patents. Armstrong began this case to accuse Hartman and Optimum of breaching exclusivity provisions in the Licensing Agreement that, in short, gave Armstrong certain exclusive rights to use the patents, along with the right of first refusal for any later inventions that improve the technology described in the patents. Hartman and Optimum allegedly breached the Licensing Agreement

through agreements to transfer ownership of the patents from Hartman to Optimum and through an expansion of Optimum's business from software only to software and hardware. Armstrong filed the original complaint on May 28, 2010 (Dkt. No. 1); defendants answered that complaint on July 1, 2010 (Dkt. Nos. 10, 11). Defendants' answers to the original complaint contained no counterclaims.

The claims in this case did not begin to escalate until Armstrong filed an amended complaint in early 2011. Armstrong sought permission to file an amended complaint to modify factual details about the breach of contract allegations. The Court granted permission on March 1, 2011, and Armstrong filed its first amended complaint on March 8, 2011. (Dkt. No. 55.) The first amended complaint contained the same counts as the original complaint and continued to assert that Armstrong has been making the necessary royalty payments under the Licensing Agreement. Armstrong, however, added a factual allegation that Hartman's sale of his three patents to Optimum constituted a breach of the Licensing Agreement and its prohibition on transferring any patent rights to anyone other than Armstrong. When Optimum answered the first amended complaint on March 22, 2011 (Dkt. No. 57), it included two counterclaims for the first time. In the counterclaims, Optimum accused Armstrong of violating the Licensing Agreement by going forward with certain construction projects without first obtaining permission from Optimum. Because Armstrong allegedly lacked permission to use the patents for certain construction projects, Optimum raised

the issue of patent infringement for the first time and accused Armstrong of infringing the three patents that it now owned.

Not to be outdone in the escalation of claims, Armstrong saw Optimum's infringement claim and raised a claim of patent invalidity that potentially would obliterate everyone's rights in this case. Armstrong originally answered Optimum's counterclaims on April 12, 2011 (Dkt. No. 58), but later filed two amended answers, the most recent one coming on May 18, 2012 (Dkt. No. 111). The second amended answer to Optimum's counterclaim for patent infringement contains an expanded claim that all three patents are invalid in the first place because they are indefinite and indistinguishable from prior art. Armstrong left unexplained why it entered a Licensing Agreement and why it has been paying approximately $400,000 in royalties for invalid patents; nonetheless, the new issue of patent invalidity necessitated a claim construction or *Markman* hearing.

The claim construction hearing, held on May 30, 2013, contrasted with the briefing that the parties filed leading up to the hearing. As seen later in this Report and Recommendation, the parties disputed numerous terms in their briefing and proposed numerous definitions for those terms. The hearing itself, however, lasted little more than two hours and featured no proffers, arguments, or testimony concerning any of the terms disputed in the parties' briefing. The hearing consisted only of two general tutorials, one from Optimum's expert witness and one from Armstrong's expert witness, followed by brief opening

statements from counsel. The parties then rested without any request for further proceedings or post-hearing briefing. The Court agreed at the end of the hearing to suspend all scheduling order deadlines until Chief Judge Skretny makes a final determination regarding this Report and Recommendation.

B. *Technology of the Three Patents*

The three patents and the extensive briefing that the parties have submitted about them explain the technology in question in considerable detail, and the Court will not repeat more of that detail than necessary. Briefly, the technology in question concerns ways to lower energy consumption for HVAC systems in buildings. Taking the patents and the briefing at face value for background purposes only, engineers have conducted studies that indicate that HVAC and similar air-conditioning systems consume as much as 20% of all electricity generated in the United States. Hartman, as the inventor who filed the patents, believed that the electricity consumption of air-conditioning systems was high in part because HVAC systems were designed to operate at a constant chilled fluid flow rate, with building temperature control coming in other ways. Hartman realized that he might be able to lower electricity consumption if he designed an HVAC system with much more flexibility to adjust flow rate, compressor and tower fan speed, and other components in ways that would maximize efficiency under a given set of cooling conditions. Accordingly, Hartman filed the three patents in question; read together for background

purposes only, the patents claim a flexible type of HVAC system that will meet a building's cooling needs with the lowest electricity consumption necessary to meet those needs.

III. DISCUSSION: *Claim Construction Generally*

The general principles governing claim construction are straightforward. "The patent is a fully integrated written instrument. By statute, the patent must provide a written description of the invention that will enable one of ordinary skill in the art to make and use it." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 978 (Fed. Cir. 1995) (en banc) (citing now-35 U.S.C. § 112(a)), *aff'd*, 517 U.S. 370 (1996). "An infringement analysis entails two steps. The first step is determining the meaning and scope of the patent claims asserted to be infringed." *Id.* at 976 (citation omitted). "[I]t is the function of the claims, not the specification, to set forth the limits of the patentee's invention. Otherwise, there would be no need for claims." *SIPCO, LLC v. Amazon.com, Inc.*, No. 2:08–CV–359–JRG, 2012 WL 5195942, at *7 (E.D. Tex. Oct. 19, 2012) (citation omitted). "To ascertain the meaning of claims, courts look to three primary sources: the claims, the specification, and the prosecution history. The specification must contain a written description of the invention that enables one of ordinary skill in the art to make and use the invention." *Id.* (citation omitted). "We have made clear, moreover, that the ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in

the art in question at the time of the invention, i.e., as of the effective filing date of the patent application." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc) (citations omitted). Constructing the hypothetical person of ordinary skill in the art requires assessing "the educational level of the inventor; the type of problems encountered in the art; the prior art solutions to those problems; the rapidity with which innovations are made; the sophistication of the technology, and the educational level of workers in the field." *Helifix Ltd. v. Blok-Lok, Ltd.*, 208 F.3d 1339, 1347 (Fed. Cir. 2000) (citation omitted). To this end, the Court agrees with Optimum that "either a bachelor's degree or equivalent in engineering and two years' HVAC-related work experience, or a Masters-level Mechanical Engineering student specializing in HVAC" (Dkt. No. 125 at 6) will suffice as ordinary skill in the art for this case.

As for testimony, courts can accept testimony or other evidence as to how a person of ordinary skill in the art would interpret claim language, but "[t]he judges are not, however, obliged to blindly follow such testimony." *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 387 (1996) (citation omitted); *see also id.* at 389 ("In the main, we expect, any credibility determinations will be subsumed within the necessarily sophisticated analysis of the whole document, required by the standard construction rule that a term can be defined only in a way that comports with the instrument as a whole.") (citations omitted). Courts need to balance the immediate task of construing claims with the long-term

responsibility to make sure that a jury at an eventual trial has instructions that will help it understand the terms in dispute. *See Sulzer Textil A.G. v. Picanol N.V.*, 358 F.3d 1356, 1366 (Fed. Cir. 2004) ("The district court simply must give the jury guidance that can be understood and given effect by the jury once it resolves the issues of fact which are in dispute. This means that, as to claim coverage, the district court must instruct the jury on the meanings to be attributed to all disputed terms used in the claims in suit so that the jury will be able to intelligently determine the questions presented.") (internal quotation marks and citations omitted).

Sometimes, inventors express a claim in a "means plus function" format. "An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof." 35 U.S.C. § 112(f). "Claim construction of a means-plus-function limitation includes two steps. First, the court must determine the claimed function. Second, the court must identify the corresponding structure in the written description of the patent that performs that function." *Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1332 (Fed. Cir. 2006) (citations omitted). "The use of the word 'means,' which is part of the classic template for functional claim elements, gives rise to a presumption that the inventor used the term

advisedly to invoke the statutory mandates for means-plus-function clauses. However, the presumption is not conclusive. For example, where a claim uses the word 'means,' but specifies no corresponding function for the 'means,' it does not implicate section 112. Likewise, where a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format." *Sage Prods., Inc. v. Devon Indus., Inc.*, 126 F.3d 1420, 1427–28 (Fed. Cir. 1997) (internal quotation marks and citations omitted).

With the above claim construction principles in mind, the Court will proceed to assess the terms that the parties have disputed in the three patents in question.

IV. CONSTRUCTION OF DISPUTED TERMS IN PATENT NO. 5,946,926 (THE '926 PATENT)

For clarity, the Court has printed the full text of each claim containing disputed language. Any language disputed by either side appears in boldface.

A. *Claim 1*

Claim 1 reads as follows:

A **chilled fluid cooling system**[1] comprising: a **chilled water generating system** having an inlet conduit and an outlet conduit for generating chilled water;

[1] Optimum is disputing this term in all claims of this patent.

a supply line having first and second ends, the first end being coupled to the outlet conduit to receive the chilled water; a variable-flow **chilled water distribution system** coupled to the second end of the supply line so as to receive all of the chilled water for distributing the chilled water to a load; a return line for carrying all of the **return water** directly from the **distribution system** to the inlet conduit so that the return water is isolated from the outlet conduit of the **generating system** whereby a change in flow rate through the distribution system is reflected in a corresponding change in flow rate into the **generating system**; a **variable-flow pump** in the return line for pumping the return water into the inlet conduit; **control means for controlling the variable-flow pump responsive to water flow rate through the distribution system**; and wherein the chilled water **generating system** includes **means for varying its capacity responsive to the flow rate of the return water into the inlet conduit**, thereby forming a single circuit cooling system.

1. *Cooling system*

Optimum proposes defining this term as “a collection of pipes or ducts, pumps or fans, heat exchangers, valves, and controls used to circulate air or water cooled by a refrigeration system through the building HVAC system.” Armstrong contends that this term needs no special definition because it was well known in the prior art and because a person of ordinary skill in the art would understand its customary meaning.

The Court finds Optimum's proposed definition acceptable. The proposed definition coincides with the language of the background section of the patent describing methods for providing cooling for medium and large commercial and industrial buildings. The proposed definition also is consistent with the specifications for the patent, which describe a subset of cooling systems called "chilled water cooling systems" that feature chilled water in the refrigeration system.

2. *Chilled fluid cooling system*

Optimum proposes defining this term as "a system which circulates a cold fluid, typically water, through a building to transfer heat from the building interior. The chilled fluid can, for example, pass through cooling coils in air handling units in order to cool the air in a building." Armstrong contends that the term has an ordinary meaning that requires no special definition. As described above, the Court finds that this term is a subset of the term "cooling system" that Optimum wanted defined. Accordingly, the Court will adapt the definition of "cooling system" and will define "chilled fluid cooling system" as "a type of cooling system in which the refrigeration occurs through circulation of cold fluid."

3. *Chilled water generating system*

Optimum proposes defining this term as "a mechanical refrigeration system that cools a water flow for use in cooling in a building." Armstrong proposes defining the term as "a series of components that functions to chill water to a

desired temperature (or a series of components that uses refrigerant to absorb heat from water, thereby chilling the water. The water can then be used in a chilled fluid cooling system.)" The Court finds that the language of the claim and the specifications repeatedly describe this term as something included in a chilled water cooling system. The same language describes this term as "having an inlet conduit and an outlet conduit for generating chilled water." This phrasing places the chilled water generating system within an overall chilled fluid cooling system, as the part of the cooling system that makes chilled water for circulation. Accordingly, the Court finds that the best definition that would reflect the understanding of someone skilled in the art is the following: "the portion or components of a chilled fluid cooling system that take in a fluid—water in particular—and refrigerate it for distribution to the rest of the cooling system."

4. *Chilled water distribution system*

The definition of "chilled water generating system" that the Court chose above leads to a corresponding definition for this term. Optimum proposes "the collection of pipes, pumps, heat exchangers, valves, and controls used to circulate chilled water from a chilled water generating system to a load, such as the cooling coils of an air handling unit," while Armstrong proposes that the phrase "distribution system" has a single ordinary meaning and needs no special definition. The Court finds that a parallel definition to "chilled water generating system" is appropriate and defines "chilled water distribution system" as "the

portion or components of a chilled fluid cooling system that receive all of the chilled water, circulate it for cooling purposes, and return it to the generating system."

5. *Return water*

Optimum proposes defining this term as "water in a fluid cooling system that has absorbed heat from a load, such as from the cooling coil of an air handling unit, and is returning to the refrigeration system." Armstrong contends that this term has a single ordinary meaning and requires no special definition. For the sake of consistency with the other definitions above, the Court modifies Optimum's proposed definition slightly and adopts the following definition: "water in a chilled fluid cooling system that had been chilled in the generating system, was circulated by the distribution system for cooling purposes, and now is returning to the generating system for re-cooling."

6. *Variable-flow pump*

Optimum proposes defining this term as "a pump in which the speed is adjusted to control the rate of fluid flow through the pump." Armstrong contends that this term has a single ordinary meaning and requires no special definition. Other references to speed in the specifications and the claims stated more specifically that the "speed" in question is the speed of the pump's motor. Additionally, the Court has some concern that the word "control" in Optimum's proposed definition sounds as if varying the speed of the motor is the exclusive

way to control fluid flow. In contrast, the language of the specifications describes changes in flow that can occur throughout the cooling system with the help of two-way valves and a differential pressure sensor that controls the pump responsive to differential pressure across the distribution system. Accordingly, the Court adopts Optimum's definition but with two minor modifications: the term "variable-flow pump" means "a pump in which the speed of the motor can be adjusted to change the rate of fluid flow through the pump."

7. *Control means for controlling the variable-flow pump responsive to water flow rate through the distribution system*

Here, Optimum proposes a definition for the entire term above while Armstrong proposes a definition for the shorter phrase "control means for controlling." The Court finds that defining the longer phrase makes more sense because the specifications do not describe anything other than the pump being controlled. As for the entire phrase, the specifications describe two possible embodiments for the means to control the pump. One embodiment would involve a differential pressure sensor that would control the variable-flow pump in response to differential pressure across the distribution system. The other embodiment would involve valves connected to the supply line and ways to control the pump in response to the valve settings. The specifications then go on to describe a preferred embodiment that would use either a static pressure sensor that would maintain a certain pressure head around the valves, or a

control network that would sense the position of the valves and then change water flow accordingly. The network would decrease water flow any time no valve was more than about 80% open. A microprocessor could be programmed to read the sensors and to manipulate the pump and the valves.

Under these circumstances, the Court finds that the following definition for "control means for controlling the variable-flow pump responsive to water flow rate through the distribution system" best fits the language of the claim and the specifications: "the use of differential pressure sensors or valve sensors, alone or in tandem, to change the speed of the variable-flow pump motor to change the water flow rate through the distribution system."

8. *Means for varying its capacity responsive to the flow rate of the return water into the inlet conduit*

Again, Optimum proposes a definition for a longer phrase, the phrase above, while Armstrong proposes a definition for the shorter phrase "means for varying its capacity." As with the previous term, the Court finds that defining the longer phrase makes more sense. The inventor is trying to vary the capacity of the chilled water generating system specifically through ways to respond to the flow rate. The specifications explain that the way to make the chilled water generating system sensitive to flow rate would involve a variable-flow pump on the inlet conduit that would return circulated water to the chilled water generating system. Creating sensitivity to flow rate also would involve a flow meter installed

on the inlet conduit to measure the flow rate of return water; the flow meter would have a way to send signals about the flow rate that it was measuring to a controller. The controller, which could be a microprocessor, would take that information into account when determining what the chilled water generating system capacity should be at any given time.

Under these circumstances, the Court finds that the best definition for "means for varying its capacity responsive to the flow rate of the return water into the inlet conduit" is "the use of variable-speed pumps or flow meters, alone or in tandem, to change the flow rate of return water to change the capacity of the chilled water generating system."

B. ***Claim 2***

Claim 2 reads as follows:

A **chilled fluid cooling system** according to claim 1 wherein the **control means for controlling the variable-flow pump responsive to water flow rate through the distribution system** includes a **differential pressure sensor** for controlling the variable-flow pump responsive to differential pressure across the **distribution system**.

1. *Chilled fluid cooling system*
2. *Control means for controlling the variable-flow pump responsive to water flow rate through the distribution system*

The Court defined these terms previously and adopts the same definitions for this claim.

3. *Differential pressure sensor*

Optimum proposes defining this term as "a device that measures the difference between pressures in two locations, typically on either side of a device such as a valve or the inlet and outlet of a pump." Armstrong contends that the term has only one ordinary meaning and that no special definition is necessary. The specifications for the patent describe a differential pressure sensor as one of two preferred embodiments for controlling the single variable-flow pump in the overall chilled fluid cooling system. The specifications describe further that the differential pressure sensor would measure the flow rate of fluid through the cooling load. Figure 6 in the patent shows how the differential pressure sensor would be wired in parallel to the cooling loads, almost like a voltmeter in an electrical circuit, to allow it to compare pressure in the fluid leaving the generating system and entering the cooling loads, and the fluid leaving the cooling loads and returning to the generating system.

Accordingly, the Court adopts a more specific version of Optimum's definition and defines this term as "a device that measures the difference between pressures for the fluid entering a cooling load and the fluid exiting a cooling load in a chilled fluid cooling system."

4. *Distribution system*

The Court previously defined the term "chilled water distribution system." Based on the language of the claims and the specifications, the two terms

effectively are identical, and the Court applies the definition of "chilled water distribution system" here.

C. *Claim 3*

Claim 3 reads as follows:

A **chilled fluid cooling system** according to claim 1 wherein the **distribution system** includes a valve connected to the supply line for **modulating flow to the load** and the **control means for controlling** the variable-flow pump includes means for controlling the variable-flow pump responsive to a setting of the said valve.

1. *Chilled fluid cooling system*

2. *Distribution system*

The Court defined these terms previously and adopts the same definitions for this claim.

3. *Modulating flow to the load*

Optimum proposes defining this term as "adjusting the flow rate of the chilled fluid delivered to a load in response to a measured variable." Armstrong contends that the term has only one ordinary meaning and requires no special definition. The claim and the specifications explain that alterations in flow to the load would occur in part through the valves connected to the supply line, which is one of the two preferred embodiments for controlling the single variable-flow pump in the overall chilled fluid cooling system. The language of the patent is

consistent with Optimum's proposed definition; accordingly, the Court adopts that definition.

4. *Control means for controlling*

The Court defined this term previously as part of the longer term "control means for controlling the variable-flow pump responsive to water flow rate through the distribution system" and adopts the same definition for this claim.

D. *Claim 4*

Claim 4 reads as follows:

A **chilled fluid cooling system** according to claim 1 wherein the **distribution system** includes multiple valves connected to the supply line for modulating flow to the load and the **control means for controlling** the variable-flow pump includes means for controlling the variable-flow pump responsive to a setting of at least one of said valves.

1. *Chilled fluid cooling system*

2. *Distribution system*

3. *Control means for controlling*

The Court defined these terms previously and adopts the same definitions for this claim.

E. *Claim 9*

Claim 9 reads as follows:

A chilled fluid cooling system according to claim 1 wherein the **means for**

varying the chiller capacity responsive to the flow rate of the return water into the inlet conduit includes a **flow meter** disposed on the outlet conduit.

1. *Means for varying the chiller capacity responsive to the flow rate of the return water into the inlet conduit*

The Court defined this term previously and adopts the same definition for this claim.

2. *Flow meter*

This term appears in Claim 8 with respect to the inlet conduit and in Claim 9 with respect to the outlet conduit. Optimum proposes defining the term as "a device that measures the mass or volume rate at which a fluid passes through a pipe or orifice." Armstrong contends that the term has a single ordinary meaning and needs no special definition. The specifications refer to a flow meter in the context of chiller capacity. The patent proposes that the capacity of the chiller can change based on the flow rate of either inbound or outbound fluid; knowing what the flow rate is would require measuring the fluid passing through the inlet or outlet conduit. The description of a flow meter in the specifications thus is consistent with Optimum's proposed definition, and the Court adopts that definition for this term.

F. *Claim 12*

Claim 12 reads as follows:

A chilled fluid cooling system according to claim wherein the **means for**

varying the chiller capacity is responsive to operation of the variable-flow pump.

1. Means for varying the chiller capacity

The Court defined this term previously as part of the longer term "means for varying the chiller capacity responsive to the flow rate of the return water into the inlet conduit" and adopts the same definition for this claim, for either an inlet or outlet conduit.

G. *Claim 25*

Claim 25 reads as follows:

A chilled fluid method of cooling a load comprising the steps of: providing **a variable-capacity chiller** for chilling a fluid; pumping the chilled fluid to the load without bypassing the load; pumping the return fluid from the load to the **chiller**, without bypassing the **chiller**, thereby forming a single circuit cooling system; varying a flow rate of the fluid through the single-circuit cooling system responsive to a **current demand level** of the load; and varying the capacity of the **chiller** responsive to the flow rate of the fluid through the cooling system, so that cooling efficiency is improved because both pumping power consumption and chilling power consumption are **modulated** responsive to changes in the **demand level** of the load.

1. *Chiller*

Optimum proposes defining this term as “a refrigeration system for cooling a liquid flow.” Armstrong contends that this term has a single ordinary meaning and that it needs no special definition. The background section of the patent contains a detailed description of a “compression type of water chiller,” which is the only type of chiller described in the patent. According to the background section, a chiller consists of an electric motor that drives a compressor, which cycles refrigerant through a low pressure gas phase, a compressed high-pressure gas phase, and a condensed liquid phase. The chiller thus is a component of the “chilled water generating system” defined previously. The specifications support classifying a chiller as a component of a chilled water generating system when they describe “a chiller for use in a single-circuit, variable-flow chilling system” and “a simple chilled water generation and distribution system” that “employs” chillers. The language of the patent thus establishes a hierarchy of components increasing in scale from a chiller, to a chilled water generating system, to a chilled fluid cooling system.

Accordingly, the Court finds that the definition of “chiller” that best matches the language of the patent is as follows: “a device that uses a compressor, evaporator, and condenser to circulate refrigerant for use in a chilled water generating system.”

2. *Variable-capacity chiller*

Optimum has requested a definition of this term over Armstrong's objection that no special definition is necessary. The definition of "chiller" that the Court reached immediately above sets up the definition for this term. In contrast to a generic "chiller," which the background and specification language in the patent presume to have a constant refrigerant flow rate, a variable-capacity chiller simply is "a chiller whose refrigerant flow rate is adjustable."

3. *Current demand level*

Here, Optimum has focused on the single word "current" and reads the term in the context of electrical charge. Optimum proposes defining the term "current" as "the rate at which electric charge flows through a conductor, measured in amperes." Armstrong agrees that the longer term "current demand level" refers to electrical charge and proposes defining the term as "[t]he amount of energy being used or electrical current being used to reach the desired temperature." Although the general discussion of all three patents and their contribution to improved efficiency necessarily implies discussions of electrical charge, the usage of the term in this claim refers more to a unit of time. The specifications and Claim 28 establish that "load" refers to a cooling coil in an air handling unit of an air conditioning system, *i.e.*, the part of the overall chilled fluid cooling system that interacts with the air circulated in a building's office or living space. That load has a certain "demand level" at any given time based on how

warm or cool the occupants of the building want their air to be. In Claim 25, the last clause refers to changes in that demand level leading to changes in power consumption and chiller capacity. The second-last clause refers to the same concept except that it adds the word "current." The way in which power consumption is discussed separate from demand or current demand suggests that "current demand level" refers to the needs of the load at a particular instant of time, while "demand level" refers to the needs of the load over a somewhat longer interval. Support for this interpretation comes from other language in the specifications and other claims; in this other language, when the inventor wants to discuss electrical charge, he explicitly discusses power consumption. At the same time, this other language makes reference to "a current flow rate of the fluid through the chiller," which is analogous to "current demand level" and obviously refers to fluid and not electrical charge. As the language in the patent reads, the only time when the term "current" may refer to electrical charge is when it is used as a noun, as in Claim 31; in all of the instances described above, however, the term "current" is used as an adjective. As an adjective, "current" implies timing.

Consequently, the Court finds that the definition of "current demand level" that best fits the language of the patent is as follows: "the cooling needs of the load at a given instant of time."

4. *Modulated*

Both sides propose definitions for this term, but the Court finds that no special definition is necessary for this single word. The ordinary understanding of "modulated" as "changed" or "adjusted" will suffice.

H. *Claim 26*

Claim 26 reads as follows:

A method according to Claim 25 wherein said providing a **chiller** includes providing a variable-speed, **centrifugal chiller** for chilling the said fluid.

1. *Chiller*

The Court defined this term previously and adopts the same definition for this claim.

2. Centrifugal chiller

Optimum proposes defining this term as "a chiller with a compressor comprised of a rotating impeller that increases the velocity of the refrigerant and a diffuser in which the refrigerant is decelerated and compressed to a higher pressure." Armstrong contends that this term has a single ordinary meaning and needs no special definition.

For Claim 31 below, the Court has defined "centrifugal pump" in a way that is somewhat similar to Optimum's proposed definition here. For the sake of consistency, the Court finds that the best definition of "centrifugal chiller" is "a chiller whose compressor uses a centrifugal pump."

I. *Claim 28*

Claim 28 reads as follows:

A method according to claim wherein the load comprises a cooling coil disposed in an **air handling unit** of an air conditioning system.

1. *Air handling unit*

Armstrong contends that the patent provides no special definition for this term and that the term thus should follow the ordinary meaning as understood by anyone skilled in the art. Armstrong proposes the following ordinary meaning: "A component that changes the temperature of air flowing inside to cool or heat the air (or a component of a building HVAC system that conditions air to a predetermined status by heating or cooling, filtering, and/ or humidifying or dehumidifying. An AHU can also control the mixture of outside air and recirculated air delivered within the building)." Optimum does not propose a definition directly in its briefing, but the expert report that it has submitted with its briefing contains the following proposed definition: "a device consisting of a fan, ductwork, filters, dampers, heating coils, cooling coils, humidifiers, dehumidifiers, sensors and controls to condition and distribute air throughout a building."

The guidance that comes from the language of the patent indicates that an air handling unit is somewhat analogous to a chilled water distribution system. The background section of the patent makes reference to air cooling coils that contain chilled water and interact with air circulating through a building. Claim 28

itself defines the term “load” by making reference to cooling coils “disposed in an air handling unit of an air conditioning system.” This language allows for two inferences. First, the use of the word “of” means that an air handling unit is a component of an air conditioning system. Second, since the cooling coils are where air circulating through a building actually cools, the air handling unit must be that portion of an air conditioning system that moves air through a building and brings air in contact with the cooling coils. In this sense, an air handling unit performs a similar function to a chilled water distribution system; as discussed above, a chilled water distribution system takes chilled water from the generating system, circulates it for heat exchange at the cooling coils, and then returns it to the generating system. As with a chilled water distribution system, the term and its associated functions do not suggest any single part or “device” but rather a number of parts working in tandem to move air around a building.

Accordingly, the Court finds that the following definition of “air handling unit” best fits the language of the patent and the functions described: “the fans, ductwork, filters, dampers, heating coils, cooling coils, humidifiers, dehumidifiers, sensors and controls that work together to distribute air throughout a building.”

J. *Claim 29*

Claim 29 reads as follows:

A method according to claim wherein said step of varying a flow rate of the fluid through the single-circuit cooling system responsive to a **current demand**

level of the load includes **inferring** the current demand of the load by measuring a flow rate of the fluid through the load.

1. *Current demand level*

The Court defined this term previously and adopts the same definition for this claim.

2. *Inferring*

Armstrong draws attention to this term and proposes finding that the term is indefinite. Alternatively, Armstrong proposes defining the term as "estimating or calculating the current required." Optimum does not discuss a possible definition directly in its briefing, but the expert report submitted with its briefing proposes defining the term as "drawing a logical conclusion from a premise." The background and specifications for the patent states that the chilled fluid cooling system invented does not directly control chilled water temperature. Rather, the invention regulates chiller capacity control in response to the flow of water through the chiller. The specifications recognize that some kind of algorithm needs to translate the direct measurement of flow rate with a flow meter to an accurate estimate of chiller capacity. This recognition of the need for a conversion or translation gives rise to the definition of "inferring" that the Court finds most appropriate here: "measuring chiller capacity indirectly by measuring the flow rate of fluid and then using some formula or algorithm to convert flow rate to chiller capacity."

K. *Claim 30*

Claim 30 reads as follows:

A method according to Claim 25 wherein said step of varying the capacity of the **chiller** responsive to the flow rate of the fluid through the cooling system includes **inferring** the current demand of the load by measuring a flow rate of the fluid through the **chiller**.

1. *Chiller*

2. *Inferring*

The Court defined these terms previously and adopts the same definitions for this claim.

L. *Claim 31*

Claim 31 reads as follows:

A method according to claim 25 further comprising providing a variable-speed, **centrifugal pump** for pumping the fluid and wherein the step of varying the capacity of the **chiller** responsive to the flow rate of the fluid through the cooling system includes measuring one of **current**, speed and **power consumption** of a motor driving the pump.

1. *Centrifugal pump*

Optimum proposes defining this term as “a pump that uses the centrifugal force of the liquid flow to increase the pressure of the liquid.” Armstrong contends that this term has a single ordinary meaning and needs no special

definition. The background section of the patents discusses the existence of several different types of compressor pumps, with a centrifugal pump being used more often than "screw and scroll" and reciprocating pumps. The rest of the patent language does not describe centrifugal pumps further, and even the extrinsic evidence that the parties have submitted describes a centrifugal compressor as little more than a compressor that increases pressure using centrifugal forces.[2] (*See* Dkt. No. 126-5 at 20.)

Nonetheless, the Court finds that a definition of this term would be useful for a jury should this case proceed to trial. Noting that centrifugal pumps employ Bernoulli's principle[3] to compress fluids, the Court finds that the following definition of "centrifugal pump" best fits the language and understanding of the patent: "a pump that uses high-speed, rotating blades to manipulate the velocity and pressure of a fluid in such a way that the fluid is compressed when it leaves the pump."

2. *Chiller*

The Court defined this term previously and adopts the same definition for this claim.

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[2] The Court takes judicial notice that "centrifugal force" generally is considered a "fictitious force" that is not a force in itself but can appear to be, based on changing frames of reference. *See, e.g.*, "Centrifugal Force," *Encyclopedia Britannica*, http://www.britannica.com/EBchecked/topic/102839/centrifugal-force (last visited July 15, 2013).

[3] *See, e.g.*, "Bernoulli's Theroem," *Encyclopedia Britannica*, http://www.britannica.com/EBchecked/topic/62615/Bernoullis-theorem (last visited July 15, 2013).

3. *Current*

Optimum proposes defining this term as "the rate at which electric charge flows through a conductor, measured in amperes." In proposing this definition, Optimum contends that the term "current" in this context differs in meaning from the way in which it is used in the term "current demand level" in Claim 25. Armstrong argues that the term as a single ordinary meaning and does not require a special definition.

The language of this claim corresponds to the language in the specifications referring to electrical charge. The second preferred embodiment in the specifications takes fluid and water flow out of the discussion by stating explicitly that no flow sensor or meter would be associated with each chiller. Instead, the chilled water pump would have a power sensor. The specifications further describe a control signal path using terms that describe the electrical functioning of the motor. The language of the claim puts the concept of fluid flow rate apart from the related electrical terms of speed and power consumption, all of which refer to a motor. "Current" appears alongside speed and power consumption. The language of the patent thus shows that "current" for this claim refers to an electrical concept and not the chronological concept of "the present time." Accordingly, the Court accepts Optimum's proposed definition.

4. *Power consumption*

Having discussed immediately above that the terms “current” and “power consumption” appear together in the language of the patent when referring to motors and electrical charges, the proper definition of “power consumption” becomes apparent. As discussed above, the claim and the specifications use the terms “current” and “power consumption” to discuss electrical charge passing through a motor, and the measurement of the electrical charge to vary the capacity of the chiller. The only difference between the two terms as they appear in the patent is one of exertion or physical movement by a motor. That is, “current” refers to electrical charge passing through a motor at a given moment regardless of the ultimate application or output of that charge, while “power consumption” refers more to the total amount of electrical charge that did in fact pass through the motor of a centrifugal pump while the motor operated over a given time interval. Optimum proposes “the maximum rate of cooling that a chiller can provide,” but that definition unnecessarily goes beyond the discussion of electrical motors in the patent and mixes concepts of fluid flow and electrical charges. Armstrong proposes that no definition is necessary, but the Court finds that the following definition is reasonable and best captures the electrical discussions in the patent: “total electrical energy usage by a centrifugal pump motor over a given amount of time.”

V. CONSTRUCTION OF DISPUTED TERMS IN PATENT NO. 6,257,007 (THE '007 PATENT)

For clarity, the Court has printed the full text of each claim containing disputed language. Any language disputed by either side appears in boldface.

A. *Claim 6*

Claim 6 reads as follows:

A variable capacity, compression type cooling system comprising: a **heat absorbing circuit** (402); a **heat rejection circuit** coupled to the heat absorbing circuit for rejecting into the environment at least a portion of heat absorbed by the heat absorbing circuit; the heat rejection circuit including: a **compressor** (404) and a motor (409) connected for driving the compressor; **a first variable-frequency drive circuit** (408) coupled to the compressor motor to power the compressor motor; a **water cooled condenser** (418) operatively coupled to an evaporative style **cooling tower** (414); the **cooling tower** including a variable-speed fan (416) for forcing air over the **condenser**, and a pump (412) for pumping cooling water through the condenser and the **cooling tower**; **a second variable-frequency drive circuit** (442) for powering the fan motor; **means for determining a present load** on the cooling system; and **means for controlling (422, 424) the second variable frequency drive circuit**

(442) in response to the present **load** on the **compressor** so as to regulate operation of the variable-speed fan in response to the load on the **compressor**.

1. *Heat absorbing circuit*

Optimum proposes defining this term as "an assembly of devices (e.g., pumps, heat exchangers, piping, and valves) designed to transfer heat from the building HVAC system to a refrigeration system." Armstrong argues that this term has a single ordinary meaning to someone skilled in the art and requires no special definition. The claim notes explicitly that the heat absorbing circuit for the invention appears as item 402 in Figures 4A and 4B. The inventor drew item 402 to look and to function like item 124 in the prior art. The background section of the patent identifies item 124 as the cooler or evaporator portion of a refrigeration or cooling system. In turn, the patent describes the cooler or evaporator as the part of a refrigeration or cooling system in which condensed liquid refrigerant changes to a gas at low pressure and absorbs heat while doing so. The refrigerant absorbs heat from either air or water depending on the design of the refrigeration or cooling system. The language of the claim is consistent with this understanding, given that it describes an overall cooling system with two general components: a component that pulls or absorbs heat from what ever air or water is supposed to be cooled; and a component that transfers the heat out of the closed cooling system and into the external environment.

Accordingly, the Court finds that the definition of "heat absorbing circuit" that best fits the language of the patent is as follows: "synonym for cooler or evaporator, the portion of a refrigeration or cooling system that converts condensed liquid refrigerant to a low-pressure gas to absorb heat from the air or water to be cooled."

2. *Heat rejection circuit*

As discussed immediately above, the use of the term "heat absorbing circuit" in the patent warrants a complementary definition for "heat rejection circuit." Armstrong argues that no special definition is necessary, but the Court will adopt a modified form of Optimum's proposed definition that conforms to the discussion of the term "heat absorbing circuit." As noted in that discussion, the patent classifies all parts of a refrigeration or cooling system into two broad categories. The "heat absorbing circuit" is the category for all parts that pull heat from whatever medium is supposed to be cooled. The "heat rejection circuit" is the complementary category for all parts that take the same heat and expel it from the cooling system altogether. The claim even describes the heat rejection circuit as being coupled to the heat absorbing circuit for the purpose of expelling absorbed heat. Accordingly, the Court finds the following definition appropriate for "heat rejection circuit": "the portion of a refrigeration or cooling system that takes heat absorbed by a heat absorbing circuit and expels it out of the cooling system into the outside environment."

3. *Load*

This term would be critical for a jury to understand at trial because all three patents in question distinguish themselves from prior art through the way in which they promote more efficient responses to "loads." A definition that a jury can understand is important also because, compared to other terms in dispute, its meaning to those skilled in the art deviates considerably from a layperson's understanding of the term. In a layperson's experience, "load" connotes a quantity of a physical object, such as a "load" of bricks or a "load" of laundry. Despite the importance and the potential confusion surrounding this term, however, neither side proposes a definition that would be useful to a jury while staying faithful to the understanding of someone of ordinary skill in the art. Armstrong argues for no definition at all; Optimum has no definition in its briefing but includes the following definition in the expert report filed with the briefing: "the instantaneous total cooling rate that needs to be supplied to a building (or a zone of a building) by an HVAC system in order to achieve or maintain a desired state of temperature, humidity, and / or air quality in the building. A load is a rate of energy transfer (e.g. Btu/hr, tons, kW)."

The language of the patent reveals that "load" relates to the demand that users place on the cooling system. The abstract of the patent describes how the invention helps a cooling system respond "to the loading level on the cooling apparatus." The abstract further summarizes how "system loading" relates to

how much power the air-conditioning compressor is using. The background section of the patent describes how cooling systems with variable capacity can reduce their capacity for "part load operation," which implies reduced demand that users are placing on the cooling system. The description of the prior art in the background section mentions a prior understanding of cooling system technology that condenser water flow remain constant at all load conditions; this language implies a cooling system that maintains constant cooling capacity regardless of user demand. The specifications describe various components of the invention that can reduce capacity and power requirements during "part load conditions," which again implies reducing cooling capacity when demand falls. The specifications further describe a controller that monitors "present loading" on the compressor at any given time, which supports the understanding that "loading" has something to do with the user demand on the cooling system and power demands on the compressor at a given time.

With the above language in mind, the Court finds that the proposed definition in Optimum's expert report sufficiently captures the nature of the term "load" as an expression of user demand. The Court thus finds the proposed definition acceptable.

4. *Compressor*

Optimum proposes defining this term as "a device that draws low pressure refrigerant vapor in from an evaporator, compresses it, and discharges it as a

higher pressure hot vapor into the condenser." Armstrong argues that the term has a single ordinary meaning and requires no special definition. The background and specifications of the patent describe a compressor in terms of an electric motor that brings the compressor or "compression device" to a rotational speed that converts lower pressure, lower temperature refrigerant gas to higher pressure, higher temperature gas. This language implies that compressors employ both Bernoulli's principle and the Ideal Gas Law[4] to manipulate the velocity, pressure, and temperature of the refrigerant gas during the refrigeration cycle. Accordingly, the definition of "compressor" that best fits the language of the patent is as follows: "a device powered by an electric motor that draws in low pressure refrigerant gas, sends it through a rotating impeller to increase its velocity and then through a diffuser to decelerate it, and then discharges it as a higher pressure hot gas."

5. *A (first, second) variable-frequency drive circuit*

Both sides appear to agree, or at least do not dispute, that the modifiers "first" and "second" refer to the ordinal or sequential arrangement of circuits in the invention. The operative term thus is "variable-frequency drive circuit." Optimum proposes defining this term as "a hydronic circuit—a piping system for a fluid—in which the pump speed is increased or decreased to change the flow rate

[4] *See, e.g.*, "The Ideal Gas Law," http://chemwiki.ucdavis.edu/Physical_Chemistry/Physical_Properties_of_Matter/Gases/The_Ideal_Gas_Law (last visited July 15, 2013).

through the system, as opposed to using valves to control the flow rate." Armstrong argues that the term has a single ordinary meaning and requires no special definition. The language of the specifications state that the invention "employs one or more variable speed drives to operate all condensing components." A close look at the figures accompanying the specifications reveals that the variable-frequency drive circuit mentioned in the claim, numbered as item 408 in Figure 4B, is visually and functionally analogous to item 308 of Figure 3. Figure 3 is an illustration of one embodiment of the invention and describes item 308 as a variable speed drive that controls the speed of the electric motor driving the compressor. In that same figure, item number 335 describes another variable frequency drive, in this instance controlling the condenser fan motor. Returning to Figure 4A and the items mentioned in the claim, items 441 and 442 describe second and third variable frequency drives that control the condenser pump motor and fan motor respectively. Optimum's expert explained during the hearing that a variable frequency drive is an electrical device that can adjust the speed of the motor by adjusting the frequency of alternating current reaching the motor. That explanation, coupled with the language of the patent, demonstrates that variable-frequency drive circuits relate to an ability to alter electrical frequency that is connected to an electrical motor. The language of the claim supports this view, as it describes how a variable-frequency drive circuit is "coupled" to a motor.

Accordingly, the Court finds that the following definition for "variable-frequency drive circuit" best fits the language of the patent: "a device that can adjust the speed of an electrical motor by adjusting the frequency of alternating current reaching the motor, combined with the wiring and other connections necessary to couple the device to the motor."

6. *Condenser / water cooled condenser*

Optimum proposes defining this term as "a heat exchanger in a refrigeration system in which heat is transferred from a low temperature fluid to an evaporating refrigerant. The refrigerant enters the evaporator as liquid and evaporates into vapor. In chilled water systems, a flow of liquid water is cooled in the evaporator, while in air systems, a flow of air is cooled." Armstrong argues that the term has a single ordinary meaning and requires no special definition. The background section of the patent describes a condenser as the part of the cooling system in which hot, higher pressure refrigerant gas condenses into a higher pressure liquid by rejecting heat out of the cooling system and into the external environment. The background section goes on to describe how the condenser can expel heat in two different ways, either through a fan that blows air across the coils of the condenser or through water from a cooling tower that is pumped through or around condenser coils. The specifications section of the patent reiterates the concept of pulling heat from hot, higher pressure gas but then adds the modification of monitoring loading on the compression device and

having a variable frequency drive alter the speed of the condenser fan motor proportionately. The claim describes the use of air and water with the condenser and varying both the speed of the air fan and the flow rate of the cooling water.

Accordingly, the Court finds that the following definition of either "condenser" or the variant "water cooled condenser" best fits the language of the patent: "the collection of pipes, heat exchange coils, motors, and related equipment that converts hot, higher pressure refrigerant gas leaving a compressor into a higher pressure liquid by expelling heat from the cooling system into the external environment."

7. *Cooling tower*

Optimum proposes defining this term as "a device in which water evaporates from a circulating water flow to a flow of ambient air. The evaporation process cools the water flow." Armstrong argues that this term has a single ordinary meaning and requires no special definition. The background section of the patent describes generally how cooling towers take water that circulates through the condenser and cool that water through an evaporative cooling process. The language of the specifications does not explain a cooling tower explicitly but does refer to a cooling system that "employs an evaporative type heat rejection apparatus." The specifications also make reference to information about load conditions converting into control signals going to an evaporative tower fan.

Accordingly, the Court finds that the following definition of "cooling tower" best fits the language of the patent: "a structure that receives chilled water exiting a condenser and cools it for recirculation through fan-assisted evaporative cooling."

8. *Means for determining a present load*

Optimum proposes defining this term as "a device that determines the present load on the compressor." Armstrong contends that the term is indefinite; alternatively, it proposes defining the term as "any device that determines the energy required by the system to reach a desired state." The claim contains this term as a way of explaining how a variable-frequency drive circuit would know to vary its frequency and thus vary the speed of an electric motor in the cooling system. The language of the specifications proposes a programmable controller that would monitor the present loading on the compressor either by measuring the present power with a power sensor or using a tachometer to measure motor speed. The specifications also permit other measurements from which loading can be inferred. Given the definition of "load" discussed above, the means for determining a present load essentially relate to a logical way of taking the intangible variable of user demand and measuring it indirectly through other objective, easily measured characteristics of the cooling system and its parts.

Accordingly, the Court finds that the following definition of "means for determining a present load" best fits the language of the patent: "means for

indirectly calculating the required total cooling rate at a given time by using a programmable controller combined with a power sensor, tachometer, or other device that measures the objective performance of some component of the overall cooling system."

9. *Means for controlling the second variable frequency drive circuit*

Optimum proposes defining this term as "a device that controls a variable frequency drive circuit in response to the present load on the compressor." Armstrong asserts that the term is indefinite; alternatively, Armstrong proposes defining the term as "any device that can control a variable frequency drive including the second and third variable frequency drives." The language of the specifications describes how, out of three variable-frequency drives in the system, the drive on the compressor motor would be considered the "first" one, while the drive connected to the condenser fan motor could be considered the "second." The specifications also describe an alternative arrangement in which a single variable speed drive operates both the compressor motor and condenser fan motor. With either embodiment, the variable-frequency drive that operates the condenser fan motor has to have a way to "know" when to vary its frequency to vary the operation of the motor. The inventor proposes supplying the variable-frequency drive with that information—thereby "controlling" it—by using a programmable controller in tandem with a power sensor that measures present

power at the compressor; a tachometer to measure motor speed; or some analogous sensor that measures the objective performance of some component of the cooling system.

Accordingly, the Court finds that the following definition of "means for controlling the second variable frequency drive circuit" best fits the language of the patent: "using a programmable controller combined with a power sensor, tachometer, or other device that measures the objective performance of some component of the overall cooling system."

B. *Claim 8*

Claim 8 reads as follows:

A variable capacity, compression type cooling system according to claim 6 where the **means for determining a present load** on the **compressor** makes that determination in response to a **level of power applied** to the **compressor** motor by the first variable-frequency drive circuit.

1. *Means for determining a present load*

2. *Compressor*

The Court defined these terms previously and adopts the same definitions for this claim.

3. *Level of power applied*

Optimum does not propose a definition for this term in its main briefing, but the expert report attached to its briefing contained the following proposed

definition: “the amount of power used to operate a device. For devices that consume electricity, this is commonly measured in kilowatts (kW).” Armstrong proposes a slightly different definition: “a potential range of power used by a component or the amount of power used to operate a device. For devices which consume electricity, this is commonly measured in watts.” The language of the claim indicates that the term has to do with one of two identified ways to determine a present load, itself a term that the Court defined above. As the Court discussed when defining “means for determining a present load,” the variable-frequency drive circuit that the invention proposes would need to know to vary its frequency and thus vary the speed of an electric motor in a compressor or some other part of the cooling system. The language of the specifications describes how the variable-frequency drive circuit would acquire that knowledge: a programmable electronic controller would receive raw data coming from a power sensor that measures present power at the motor, a tachometer that measures motor speed, or some other sensor measuring some other objective performance of the system that could relate to loading. Optimum’s proposed definition fits the specifications better because the amount of power that an electric motor in the cooling system actually is using at a given moment is more important to the invention than any potential power usage.

Accordingly, the Court finds Optimum’s proposed definition acceptable.

C. *Claim 9*

Claim 9 reads as follows:

A variable capacity, compression type cooling system according to claim 6 where the **first variable-frequency drive circuit** is arranged to provide the indication of the present load level of the **compressor**.

1. *First variable-frequency drive circuit*

2. *Compressor*

The Court defined these terms previously and adopts the same definitions for this claim.

D. *Claim 10*

Claim 10 reads as follows:

A variable capacity, compression type cooling system according to claim 6 where the **means for determining a present load** on the **compressor** determines a percentage of full power applied to the **compressor** motor; and the **means for controlling the second variable-frequency drive circuit** is configured to regulate the second variable-frequency drive circuit at the said percentage of full power; thereby reducing the **condenser** fan speed to save power while **system loading** is below maximum loading.

Here, the Court finds that it defined all of these terms previously and adopts the same definitions for this claim. For the term “system loading,” the

Court finds from the language of the claim and specifications that the term is synonymous with the term “load” and adopts the corresponding definition.

E. ***Claim 11***

Claim 11 reads as follows:

A variable capacity, compression type cooling system according to claim 6: wherein the pump comprises a variable-speed pump (412) powered by a third variable-frequency drive circuit (441); and further comprising **means for controlling (422, 423) the third variable frequency drive circuit** (441) in response to the present load on the **compressor** so as to regulate operation of the cooling tower pump in response to the load on the **compressor**.

Here, the Court finds that it defined all of these terms previously and adopts the same definitions for this claim.

F. ***Claim 12***

Claim 12 reads as follows:

A variable capacity, compression type cooling system according to claim 11 wherein: the **means for determining a present load on the compressor** determines a percentage of full power applied to the **compressor** motor; the **means for controlling the second variable-frequency drive circuit** is configured to regulate the second variable-frequency drive circuit at the said percentage of full power; thereby reducing the **condenser** fan speed to save power while **system loading** is below maximum loading; and the **means for**

controlling the third variable-frequency drive circuit is configured to regulate the third variable frequency drive circuit at the said percentage of full power; thereby reducing the **cooling tower** pump speed to further save power while **system loading** is below maximum loading.

Here, the Court finds that it defined all of these terms previously and adopts the same definitions for this claim.

G. *Claim 14*

Claim 14 reads as follows:

A method of operating a variable capacity, **compression type cooling system** having a heat rejection circuit including a motor connected for driving a **compressor**, the method comprising the steps of: determining a present load level of the **compressor** based on power input to the compressor; and **regulating operation** of the heat rejection circuit in response to the present load level of the **compressor**.

1. *Compression type cooling system*

In its briefing, Optimum proposed definitions for the separate phrases "compression type" and "cooling system." Fusing these definitions together, Optimum proposes defining "compression type cooling system" as "a collection of pipes or ducts, pumps or fans, heat exchangers, valves, and controls used to circulate air or water cooled by a refrigeration system in which the pressure of the refrigerant vapor is increased mechanically." Armstrong argues that the term has

a single ordinary meaning and requires no special definition. The background section of the patent discusses the basic features of cooling systems for buildings, including compressors driven mechanically by electric motors to a particular rotational speed. The specifications for the patent set forth three embodiments for the invention, all of which include the same kind of compressor rotating at a certain speed with the help of an electric motor. The mention of electrical motors and rotational speed implies that the type of compressor contemplated has an impeller that mechanically compresses refrigerant gas in accordance with Bernoulli's principle.

Accordingly, the Court finds that the following definition of "compression type cooling system" best fits the language of the patent: "a collection of pipes or ducts, pumps or fans, heat exchangers, valves, and controls used to circulate air or water cooled by a refrigeration system, in which the pressure of the refrigerant vapor is increased mechanically."

2. *Compressor*

The Court finds that it defined this term previously and adopts the same definition for this claim.

3. *Regulating operation*

Optimum did not include the proposed definition for the term in its main briefing, but the expert report attached to the briefing contains the following proposed definition: "controlling the variables (e.g. flow rate, temperature) of a

cooling circuit to meet specified criteria." Armstrong argues that the term is indefinite. The language of the specifications describes how the overall goal of the invention is to control all of the components of the heat rejection circuit including the compressor, condenser, and cooling tower fan. The embodiments in the specifications all describe how control of the heat rejection circuit comes from measuring the objective performance of a particular component and then using a programmable controller and an algorithm to convert that measurement into a measurement of load. The objective performances that can be measured include, but are not limited to, measuring the compressor motor's power consumption with a power sensor and using a tachometer to measure motor speed. The specifications thus are consistent with the claim itself, whose plain language states that the "regulating operation" does something to the heat rejection circuit as a result of the present load level of the compressor.

Accordingly, the Court finds that the following definition of "regulating operation" best fits the language of the patent: "varying the compressor motor speed, condenser flow rate, condenser fan speed, tower fan speed, or some other objective performance for a component of the heat rejection circuit."

H. *Claim 16*

Claim 16 reads as follows:

A method according to claim 14 wherein the **compressor** is driven by a

motor and said determining step includes **acquiring an indication of power** applied to the motor driving the **compressor**.

1. *Compressor*

The Court finds that it defined this term previously and adopts the same definition for this claim.

2. *Acquiring an indication of power*

Armstrong proposes defining this term as "the mental process performed by a system operator of discerning the power used at a point in time." Optimum has not proposed a definition. The Court finds that this term is simply an awkward rephrasing of the idea that operating the variable capacity, compression type cooling system described in the patent requires knowing the power consumption at the compression motor at any given time. The specifications again describe measuring power consumption with a power sensor as one way to control the heat rejection circuit and the overall cooling system by inferring present load. The claim itself refers back to Claim 14, which states explicitly that measuring power input to the compressor is the first step toward operating the cooling system. In this context, the Court finds that "acquiring an indication of power" is synonymous with "level of power applied" and adopts the definition that it set forth above for the latter term.

I. *Claim 17*

Claim 17 reads as follows:

A method according to claim 16 wherein said **acquiring an indication of power** applied to the motor driving the **compressor** includes determining a percentage of maximum power; and said **regulating operation** of the heat rejection circuit includes operating the heat rejection circuit at a **predetermined ratio** times said percentage of maximum power.

1. *Acquiring an indication of power*

2. *Compressor*

3. *Regulating operation*

The Court finds that it defined all of these terms previously and adopts the same definitions for this claim.

4. *Predetermined ratio*

Armstrong proposes defining this term as "a ratio or figure known to the operator or programmed into the system." Optimum has not proposed a definition. The language of the specifications explains that the ratio in question corresponds to the use of the term "algorithm" or "predetermined algorithm." The inventor proposes, as one embodiment, that a programmable controller use a power sensor to measure power consumption of the compression motor at a given time. That measurement would be expressed as actual power consumption and as a percent or ratio of maximum power that the compressor

motor can handle. The controller then applies an unspecified algorithm to the power ratio to calculate a "setpoint" or "optimum" power level for the condenser pump and the cooling tower fan given the current loading conditions. The specifications summarize that the heat rejection circuit ultimately will operate at an optimal power level based on the compressor power ratio as run through the algorithm. This summary corresponds to the language in the claim that states that the heat rejection circuit will operate "at a predetermined ratio times said percentage of maximum power." Comparing the language of the specifications and of the claim, the word "operating" and the idea of a power percentage appear in both places. The only difference is that "algorithm" appears in the specifications while "predetermined ratio" appears in the claim.

In this context, Armstrong's proposed definition covers the part of the predetermined ratio process that requires programming or setting up an algorithm and the part of the process that runs the algorithm and ends with a number. Accordingly, the Court finds that Armstrong's proposed definition is acceptable.

J. *Claim 18*

Claim 18 reads as follows:

A method according to claim 17 wherein the **heat rejection circuit** includes a water-cooled **condenser** and said **regulating operation** of the **heat rejection circuit** includes regulating water flow rate in the condenser.

The Court finds that it defined all of these terms previously and adopts the same definitions for this claim.

VI. CONSTRUCTION OF DISPUTED TERMS IN PATENT NO. 6,185,946 (THE '946 PATENT)

For clarity, the Court has printed the full text of each claim containing disputed language. Any language disputed by either side appears in boldface.

A. *Claim 1*

Claim 1 reads as follows:

A system comprising at least two variable speed **chillers arranged in parallel**, each **chiller** including a refrigerating cycle that includes a variable speed **compressor**, an **evaporator**, a **condenser**, and a **refrigerant expansion device**, and wherein the speed of all operating **chillers** is coordinated by a **common controller** to meet a **cooling load**, comprising: **means for transmitting a first control signal** from each **chiller** to the common **controller** to communicate speed of the corresponding **chiller**; **means for transmitting a second signal** from each **chiller** to the common controller to communicate a **current head** of the corresponding **compressor**; the **controller** including **first means responsive** to the first control signals and the second control signals from all of the operating **chillers** for determining a **current operating point** of the system without regard to load; the **controller** further including **second means for selecting** a specific number of **chillers** such that the selected number of **chillers** in operation at the current operating point of the system would be operating a [sic]

closely as possible to their **predetermined natural curve** of operating efficiency; and the **controller** further including third **means for adjusting** the number of **chillers** on-line such that it equals the selected number of **chillers**, thereby **improving overall operating efficiency** of the system, while still enabling the system to accommodate the load by adjusting speed of the adjusted number of on-line **chillers**.

1. *Chiller*
2. *Compressor*
3. *Condenser*

The Court defined all of these terms previously for the first two patents discussed. While mindful that each patent defines its own language, the Court finds that these terms cover the same devices operating in the same way and are described with the same language. The Court thus adopts the same definitions used previously.

4. *Chillers arranged in parallel*

Optimum proposes defining this term as "chillers arranged in a circuit so that the fluid flowing through the system can pass through one but only one of the components." Armstrong argues that this term has a single ordinary meaning and requires no special definition. The language of the background and specifications demonstrates that the entire purpose of the invention is to change an assumption in the industry regarding the sequencing of chillers. Prior to this

invention, the industry purportedly took a uniform approach to managing cooling systems with multiple chillers. The industry assumed that maximum efficiency would come when one or more chillers already operating reached full capacity before bringing an additional chiller online. The invention attempts to change the assumption by showing how efficiency can improve when some or all chillers are operating at less than full capacity. Critical to this claimed improvement in efficiency is the ability of each chiller to operate and to contribute to the cooling of the refrigerant completely independently of any other chiller, with only a programmable controller coordinating the capacities of the chillers. In an analogous way to electrical wiring, the independence of the chillers defines the parallel configuration.

Accordingly, the Court finds that the following definition of "chillers arranged in parallel" best fits the language of the patent: "chillers arranged in a circuit that allows any one chiller to operate independently of any other chiller."

5. *Evaporator*

Optimum proposes defining this term as "a heat exchanger in a refrigeration system in which heat is transferred from a low temperature fluid to an evaporating refrigerant. The refrigerant enters the evaporator as liquid and evaporates into vapor. In chilled water systems, a flow of liquid water is cooled in the evaporator, while in air systems, a flow of air is cooled." Armstrong argues that the term has a single ordinary meaning and requires no special definition.

The language of the specifications demonstrates that the evaporator is the part of each chiller in which higher pressure liquid refrigerant has entered a low pressure area and then interfaces with water that is circulating from the action of chilled water pumps. The change from high pressure to low pressure causes the liquid refrigerant to change into a gas, absorbing heat from the circulating water in the process. Since the description of the function of the evaporator matches Optimum's proposed definition, the Court finds that the proposed definition is acceptable.

6. *Refrigerant expansion device*

Optimum proposes defining this term as "a device in which the pressure of flowing liquid refrigerant is decreased, lowering its temperature. The low temperature refrigerant flow leaves the expansion device as a mixture of liquid and vapor and enters an evaporator." Armstrong argues that the term has a single ordinary meaning and requires no special definition. The language of the specifications describes how a refrigerant expansion device receives higher pressure liquid refrigerant and exposes it to a lower pressure environment. Optimum's proposed definition captures that function and complements the accepted definition of "evaporator." The Court thus finds optimum's proposed definition of "refrigerant expansion device" acceptable.

7. *Common controller*

Optimum proposes defining this term as "a supervisory or central controller that controls multiple devices or controllers." Armstrong proposes defining this term as "a single master control device, separate from other controllers, used to govern the speed of all chillers in the system." The specifications do not contain much language directly describing a common controller. The specifications do say, however, that all of the chillers in a cooling system set up as described in the patent would need to be coordinated based on efficiency curves and a programmed logic for determining when to add or shed chillers. The specifications add that the logic reflected in the inventor's formulas can be programmed into any system. The other two patents at issue in this case contain considerable discussion of controllers as electronic programmable circuits, and while each patent has to be assessed on its own, the technology and components behind the cooling system discussed in this patent are common to all three patents and are described with the same language.

Accordingly, the Court makes a slight modification in Armstrong's proposed definition and finds that the following definition of "common controller" best fits the language of the patent: "a single master control device, separate from other controllers, used to govern all chillers in the system."

8. *Cooling load*

Armstrong proposes defining this term as "the amount of heat energy that must be removed from a system to maintain a desired temperature system." Optimum included no definition for this particular term in its briefing. However, Optimum included the following definition in its expert report for the term "load": "the instantaneous total cooling rate that needs to be supplied to a building (or a zone of a building) by an HVAC system in order to achieve or maintain a desired state of temperature, humidity, and / or air quality in the building. A load is a rate of energy transfer (e.g. Btu/hr, tons, kW)." Additionally, Optimum's briefing and expert report refer to the term "cooling load" numerous times, equating the term to chiller capacity, system loading, and demand level. The claim itself introduces the term "cooling load" and then subsequently uses the term "load" or "the load," suggesting that "load" is short for "cooling load" and that the terms have the same meaning. The language of the background and specifications support this interpretation. The background section makes reference to chilled water being delivered to "the cooling loads" and then returning "from those loads." (Dkt. No. 126-3 at 7.) The specifications do not use the term "cooling load" at all, preferring the shorter term "load" instead.

Accordingly, the Court finds that the terms "load" and "cooling load" are synonymous and finds that the following definition of "cooling load" best fits the language of the patent: "the instantaneous total cooling rate that needs to be

supplied to a building (or a zone of a building) by an HVAC system in order to achieve or maintain a desired state of temperature, humidity, and / or air quality in the building. A load is a rate of energy transfer (e.g. Btu/hr, tons, kW)."

9. *Means for transmitting a (first, second) control signal*

Optimum proposes defining this term as "a device that communicates the speed of each chiller in a system to the common controller." Armstrong contends that the term is indefinite but alternatively proposes defining the term as "a device separate from the common controller that sends information on speed from each chiller in a system to the common controller." The language of the specifications discusses the natural curve of highest efficiency for a given variable-speed compressor and load. Knowing the natural curve requires knowing current and maximum head pressure, and current and maximum compressor speed, all of which enters a formula that "can be programmed into virtually any modern chiller plant control system." (Dkt. No. 126-3 at 9.) The specifications do not provide any technical details about how to capture current head pressure and speed since "[t]he present invention is focused on sequencing of equipment." (*Id.*) Claims in the patent listed after this claim state or imply that pressure sensors and tachometers, as separate devices, would acquire this information for the common controller.

Accordingly, the Court adopts Armstrong's proposed alternative definition as acceptable.

10. *Current head*

Armstrong proposes defining this term as "the current used by the compressor or the head." Optimum included no proposed definition in its briefing. The background section of the patent refers to existing ways to adjust chiller capacity or sequencing using "current head pressure or condensing temperature." The language of the specifications describes how "head pressure on the chiller" becomes part of the formula for determining the best efficiency for a compressor at any given speed. The specifications then proceed to define a variable called the Head Pressure Fraction, defined as "a ratio of the average current compressor head pressures compared to the design maximum." Together, the specifications make apparent that "head pressure" or "current head" refer to a physical type of pressure and not to a difference in current. The specifications also make apparent that head pressure refers to the pressure that a compressor is generating when it discharges higher temperature, higher pressure refrigerant gas. This interpretation is consistent with the overall concept in the patent that a compressor's motor speed and pressure can help determine the most efficient way to sequence chillers in response to a given load.

Accordingly, the Court finds that the following definition of "current head" best fits the language of the patent: "the pressure generated by a compressor, or the pressure difference between refrigerant exiting and entering the compressor, at a given time."

11. *First means responsive*

Optimum proposes defining this term as “a device that determines the operating point of the system based on the speed and head pressure.” Armstrong contends that the term is infinite. This phrase appears only once in the patent, within the claim itself. The claim, however, uses the word “including” to indicate that the “first means responsive” is a part or a component of the common controller. As the claim reads, the “first means responsive” is an ability that the common controller has to take information about speed and pressure and to find the place or operating point on a chiller’s natural curve that maximizes efficiency under particular loading conditions. The claim states that finding the operating point occurs “without regard to load” because the sequencing that occurs here accepts whatever load might be present at a given time and focuses instead on maximizing efficiency. The language of the specifications supports this interpretation because it describes in detail how a natural curve would be determined and optimized in response to speed and pressure.

Accordingly, the Court finds that the following definition of “first means responsive” best fits the language of the patent: “the ability of the common controller to use control signals regarding speed and pressure to determine a current operating point for the overall system.”

12. *Current operating point*

Optimum proposes defining this term as “the point at which the pump curve crosses the system curve representing the static lift and head losses due to friction and minor losses. When these curves are superimposed, the operating point can easily be found.” Armstrong argues that the term is indefinite. The abstract for the patent begins a distinction between “current operating point” and “natural curve of maximum efficiency.” Reconciling these two pieces of information through adding or shedding chillers brings the overall system closer to “an operating curve of optimal efficiency.” The language of the specifications explains Figure 3 in the patent and describes how the term “operating point” has something to do with accepting a given load and finding that, for example, four equally sized chillers could accommodate a 65% overall system capacity if three of them came online and operated at 75% capacity while the fourth remained off-line. As the patent explains, an alternative arrangement—and a more efficient one, which is the point of the whole patent—would involve running all four chillers at a lower capacity and bringing the overall system closer to its natural curve. The specifications thus reveal that an overall cooling system can take any particular load and accommodate it through multiple chiller configurations, each one of those configurations being an operating point. Of all of the theoretically possible operating points, one will represent optimal efficiency.

Accordingly, the Court finds that the following definition of "current operating point" best fits the language of the patent: "the number of chillers operating, and the respective capacity of each operating chiller, at any given time."

13. *Second means for selecting*

Optimum proposes defining this term as "a device that determines the desired operating point, compares the current operating point to the desired operating point, and determines the number of chillers to operate." Armstrong contends that the term is indefinite. As with the term "first means responsive," an important aspect of the "second means for selecting" is that it is a subordinate part or component of the common controller. The language of the claim makes this apparent when it defines the controller as "further including" the second means for selecting. As with the "first means responsive," then, the common controller in the invention comprises a physical device plus specific functions that the device can perform. The claim and the specifications elaborate that the function in question here is the final step in regulating the overall system at optimal efficiency. Accepting any particular load without measuring it directly or trying to change it, the multi-chiller system proceeds first by determining the present configuration of chillers that are online and at what capacity they are operating. The system then uses information from the component manufacturers or centrifugal fan, pump and compressor laws to calculate what the most efficient

configuration is. The final step, captured here, is to compare the configuration that is and the configuration that "ought to be" and to adjust the chillers accordingly to reconcile the two. The specifications discuss at length how to know when chillers should be added or shed.

Accordingly, the court finds that the following definition of "second means for selecting" best fits the language of the patent: "the ability of the common controller to compare a current operating point for the overall system with a predetermined natural curve of operating efficiency and to adjust the operating point to match the natural curve as nearly as possible."

14. *Predetermined natural curve*

Optimum proposes defining this term as "the locus of points of highest chiller operating efficiency at various condenser water temperature and load conditions. The natural curve is developed by connecting the points of highest efficiency for each condensing water temperature." Armstrong proposes defining the term as "the manufacturer-supplied operating characteristics of a chiller." The problem with Armstrong's proposed definition is that the specifications set forth explicitly that chiller operators can calculate the natural curve from centrifugal fan, pump and compressor laws when they cannot obtain the necessary data from manufacturers. Armstrong's proposed definition thus is too narrow. Meanwhile, the specifications discuss in considerable detail, and illustrate with figures, how a multi-chiller system can accommodate a given load in numerous combinations of

chiller capacities, only one of which will minimize power consumption and thus be the most efficient. The efficiencies for different combinations can be plotted in advance, and those plots follow curved patterns.

Accordingly, the Court finds Optimum's proposed definition acceptable.

15. *Means for adjusting*

Optimum proposes defining this term as "a device that determines based on specified criteria whether to add or shed a chiller and communicates a signal to the local controllers on individual chillers either to turn on and run at a given speed or to not operate." Armstrong considers the term indefinite but, in the alternative, proposes defining it as "a device that adjusts the number of operating chillers." The discussion above for other terms captures how this term embodies the final step of multi-chiller system regulation—namely, the reconciling of an actual current operating point to the operating point that would provide maximum efficiency. The information that would prompt the adjustment is missing from Armstrong's proposed definition and makes that definition incomplete. Upon reviewing the language of the specifications, the Court finds Optimum's proposed definition acceptable.

16. *Improving overall operating efficiency*

Optimum did not include a definition for this term in its main briefing, but the expert report accompanying the briefing proposes defining the term as "reducing total system purchased energy required to meet the building cooling

load." Armstrong argues that the term is indefinite but, in the alternative, proposes defining the term as "a measure of the improved or reduced energy use when the system is employed (or reducing total energy required to meet the building cooling load)." The language of the specifications describes in some detail how the sequencing process invented will improve efficiency. The essence or the importance of the efficiency, though, comes through most clearly at the very beginning of the background section, which cites an estimate that as much as 20% of all electricity generated in the United States is used for compression-type cooling applications. Since obviously energy costs money to generate, a figure as large as 20% of all domestic electricity generation has enormous cost implications that spurred the creation of the system explained in the specifications. Both proposed definitions fit the discussion in the specifications, but Optimum's proposed definition better captures the economic basis for seeking improved efficiency in the first place. Accordingly, the Court adopts Optimum's proposed definition.

B. *Claim 2*

Claim 2 reads as follows:

A method according to claim 1 wherein the means for adjusting the number of **chillers** on-line comprises a **predetermined procedure** for adding a **chiller** on-line and a predetermined procedure for **shedding** a **chiller**.

1. *Chiller*

The Court previously defined this term for the ‘926 Patent as “a device that uses a compressor, evaporator, and condenser to circulate refrigerant for use in a chilled water generating system.” The Court is mindful that each patent in a claim construction stands independently of any other, but in this instance, the term, accompanying language, and technology at issue are exactly the same and do not require separate definitions. The specifications of this patent additionally use the term in the same context to describe the same features. The Court accordingly will use the same definition here.

2. *Predetermined procedure*

Armstrong proposes defining this term as “a specific procedure for adjusting the number of chillers that are online.” Optimum has proposed no definition. The specifications contain two distinct subheadings describing how, in this invention, individual chillers in a multi-chiller system actually go online or off-line. One of the subheadings is titled, “Adding a chiller,” and the accompanying discussion sets forth an independent or “predetermined” formula that always informs the common controller when to bring an additional chiller online. Similarly, the other subheading is titled, “Shedding a chiller,” with an analogous formula and discussion that would guide a common controller to a decision to bring a chiller off-line. In either instance, the decision to add or to shed a chiller comes based on how the average operating differential pressure across the

operating compressors compares to the natural efficiency curve for the overall system.

Accordingly, the Court finds that the following definition of "predetermined procedure" best fits the language of the patent: "a stepwise logic or decision-making process that compares the average operating differential pressure across the operating compressors to the natural efficiency curve for the overall system and guides the common controller to a decision whether to add or to shed a chiller."

3. *Shedding*

Optimum proposes defining this term as "turning off a chiller in an HVAC system with multiple chillers." Armstrong argues that this term is a single ordinary meaning and requires no special definition. The above discussion for the term "predetermined procedure" summarizes how the specifications set forth a precise decision-making process for taking a chiller off-line; the description of that process explicitly carries the subheading of "Shedding a chiller." Optimum's proposed definition thus matches the language of the specifications, and the Court adopts that definition accordingly.

C. *Claim 3*

Claim 3 reads as follows:

A system according to claim 1 wherein the means of determining the compressor **head** pressure for each chiller comprises a pressure sensor

arranged for measuring a difference between the chiller condenser and the chiller evaporator pressures.

1. *Head*

Optimum proposes defining this term as "a measure of the pressure a fluid exerts on its container. For a pump or compressor, head refers to the pressure rise that is imparted to the flowing fluid. Head is typically measured in units of pressure (e.g. pounds per square inch or psi) or in feet of water (i.e. the number of feet of water in a vessel that would generate the given pressure)." Armstrong has proposed no definition for this term apart from its proposal for the related term "current head," discussed previously. The language of this claim, Claim 4, and the specifications all indicate that the overall system attaches importance to the increase in pressure that occurs when the lower temperature, lower pressure refrigerant gas enters the compressor and leaves as higher temperature, higher pressure gas. Additionally, the discussion about the natural curve of highest efficiency for a compressor indicates that the concept of head pressure relates to the speed of the compressor's motor, further indicating that the term "head" has to do with refrigerant gas increasing in pressure as it proceeds through the compressor.

After reviewing the language of the specifications, the Court finds that Optimum's proposed definition of "head" is acceptable with one modification: given that the compressors in the invention handle refrigerant gas and not a fluid,

the Court replaces the term “fluid” in Optimum’s proposed definition with “fluid or gas.”

D. *Claim 5*

Claim 5 reads as follows:

A system according to claim 1 wherein the means of determining the **compressor** speed includes **means for measuring a power draw** of the motor driving the **compressor** and **means for calculating the motor speed based on the measured driving motor power draw**.

1. *Compressor*

The Court previously defined this term for the ‘007 Patent as “a device powered by an electric motor that draws in low pressure refrigerant gas, sends it through a rotating impeller to increase its velocity and then through a diffuser to decelerate it, and then discharges it as a higher pressure hot gas.” The Court is mindful that each patent in a claim construction stands independently of any other, but in this instance, the term, accompanying language, and technology at issue are exactly the same and do not require separate definitions. The specifications of this patent additionally use the term in the same context to describe the same features. The Court accordingly will use the same definition here.

2. *Means for measuring a power draw*

Optimum proposes defining this term as “a device that measures the power

delivered to the motor either directly or indirectly." Armstrong argues that the term is indefinite; in the alternative, Armstrong proposes defining the term as "a device that measures the power used by a component of the system." The specifications do not measure compressor motor power consumption directly, but they do discuss in detail how to measure compressor performance as a percentage of maximum capacity and in relation to various efficiency curves for the overall system. Whether measuring power consumption, motor speed, or head pressure, the invention's general goal is to measure something independent of load that will run through predetermined formulas to calculate the most efficient configuration of chillers in a multi-chiller system.

Accordingly, the Court finds that the following definition of "means for measuring a power draw" best fits the language of the patent: "a device that measures the total electrical energy usage by a compressor motor over a given amount of time."

3. *Means for calculating the motor speed based on the measured driving motor power draw*

Optimum proposes defining this term as "a device that determines motor speed based on operating variables." Armstrong has proposed no definition for this term, but the Court finds Optimum's proposed definition too vague. For other aspects of the invention, the specifications describe the use of formulas for converting different direct measurements of system performance into indirect

measurements of broader goals like efficiency. The language of the claim supports this interpretation through its use of the term "calculating," which implies formulas and not physical devices. Accordingly, the Court finds that the following definition best fits the language of the patent: "the use of formulas, algorithms, or similar predetermined logic to convert total electrical energy usage by a compressor motor into an indirect measurement of motor speed."

VII. CONCLUSION

For all of the foregoing reasons, the Court respectfully recommends construing the disputed patent terms in this case as described above.

VIII. OBJECTIONS

A copy of this Report and Recommendation will be sent to counsel for the parties by electronic filing on the date below. Any objections to this Report and Recommendation must be electronically filed with the Clerk of the Court within 14 days. *See* 28 U.S.C. § 636(b)(1); FRCP 72. "As a rule, a party's failure to object to any purported error or omission in a magistrate judge's report waives further judicial review of the point." *Cephas v. Nash*, 328 F.3d 98, 107 (2d Cir. 2003) (citations omitted).

SO ORDERED.

/s Hugh B. Scott

HONORABLE HUGH B. SCOTT
UNITED STATES MAGISTRATE JUDGE

DATED: July 15, 2013